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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/647,662	02/02/2001	Martin Topsoe	2954/OH643	1457

7590 01/29/2003  
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EXAMINER

DOVE, TRACY MAE

ART UNIT	PAPER NUMBER
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1745

DATE MAILED: 01/29/2003

9

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/647,662

Applicant(s)

TOPSOE ET AL.

Examiner

Tracy Dove

Art Unit

1745

#9

-- **Th MAILING DATE of this communication appears on the cover sheet with th corresp ndence address --**  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 02 February 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-17 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 2,5,6,11 and 17 is/are rejected.
- 7) ☐ Claim(s) 1,3,4,7-10 and 12-16 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.  
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).  
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 6,8. 6) ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Priority***

Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

### ***Claim Objections***

Claim 1 is objected to because of the following informalities: in line 19, after “T<sub>gel</sub>” insert “;” and at the end of the claim insert “.”. Appropriate correction is required.

Claim 4 is objected to because of the following informalities: in line 3 “50.000-500.000” should recite “50,000-500,000” and in line 4 “100.000-300.000” should recite “100,000-300,000”. See page 7 of the specification. Appropriate correction is required.

Claim 7 is objected to because of the following informalities: “polymer(s)” should be replaced with “polymer” because claim 1 recites “a polymer”. Appropriate correction is required.

### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 2, 5, 6, 11 and 17 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 2 recites improper Markush group language. Examiner suggests amending “from the group of monomers of vinyl...” to recite “selected from the group of monomers consisting of vinyl...”.

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Claim 5 recites improper Markush group language. Examiner suggests amending "one or more solvent(s) selected from the groups (a) to (e)" to recite "one or more solvent(s) selected from the group consisting of".

Note claims 6, 11 and 17 contain improper Markush language. See above.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

- (e) the invention was described in-
  - (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effect under this subsection of a national application published under section 122(b) only if the international application designating the United States was published under Article 21(2)(a) of such treaty in the English language; or
  - (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that a patent shall not be deemed filed in the United States for the purposes of this subsection based on the filing of an international application filed under the treaty defined in section 351(a).

Claim 17 is rejected under 35 U.S.C. 103(e) as being unpatentable over Kejha, US 5,705,084 in view of Kejha, US 6,080,511.

Kejha '084 teaches a polymer electrolyte for electrochemical devices. The polymer electrolyte is formed by heating a mixture of dimethyl carbonate, ethylene carbonate (solvent), lithium perchlorate (LiClO<sub>4</sub> salt), PVDF/HFP (polyvinylidene fluoride-hexafluoropropylene) copolymer and PEO (polyethylene oxide) to 90°C while stirring to dissolve the PVDF and PEO. The polymer mixture was then coated hot onto an oxide based electrode (incorporated into a cell). The mixture was then cooled to 27°C to form a gelled electrolyte. See Example IV of Kejha '084 and Example 2 of Kejha '511. Kejha '511 is used as evidence that the method disclosed in Example IV of Kejha '084 results in a gelled electrolyte (semi-solid ion conductive layer). The methods of Example IV of Kejha '084 and Example 2 of Kejha '511 are identical.

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The weight percentages of the solvents, salts and polymers for Example IV are disclosed in col. 6, lines 1-9 (claim 7). The positive electrode is an oxide based electrode and the negative electrode is a lithiated carbon based electrode. As evidenced by *Kejha '511*, the oxide may be  $\text{LiCoO}_2$  and the carbon may be graphite (col. 2, lines 64-col. 3, lines 10).

*Kejha '084* does not explicitly state that polymer mixture is heated to a first temperature to dissolve the polymer mixture and then to a second temperature prior to cooling to gel the polymer (method limitation).

However, the invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made because the courts have ruled that product-by-process limitations, in the absence of unexpected results, are obvious. Thus, whether the polymer mixture is heated to a first temperature and then to a second temperature (two steps), or just heated to the second temperature (one step), the product, as an end result, is the same. In re Fessman.

#### *Allowable Subject Matter*

Claims 1-16 would be allowable if rewritten or amended to overcome the rejection(s) under 35 U.S.C. 112, second paragraph, and objections set forth in this Office action.

The following is a statement of reasons for the indication of allowable subject matter: the claims are directed toward a method of preparing a polymer electrolyte wherein an electrolyte precursor comprising solvent(s), salt(s) and a polymer is heated to a first temperature  $T_{\text{dissol}}$  and then incorporated into the electrochemical cell. After incorporation into the electrochemical cell, the cell is heated to a second temperature  $T_{\text{gel}}$ . The cell is subsequently cooled to ambient temperature to gel the polymer in the polymer electrolyte.  $T_{\text{dissol}}$  is lower than  $T_{\text{gel}}$ .

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The prior art does not teach the method of instant claim 1. Note that when the precursor is incorporated into the electrochemical cell, the cell is interpreted as having an anode, a cathode and a separator. The claim does not encompass polymer electrolyte precursors that, for example, are applied to a single electrode before the cell is fabricated. The claim does not encompass polymer precursor mixtures that upon gelling perform the function of both separator and electrolyte. See the instant specification, page 10, which discloses “the electrolyte is applied on a wound cell, i.e. the winding of the cell is done prior to electrolyte impregnation” and “the electrolyte is filled into cell-laminates...separation arises because the gap between the electrode laminates is ...”. Also, the examples teach that the cell is wound before the electrolyte precursor is incorporated.

Hoshi et al., WO97/48106 teaches a hybrid electrolyte and method of preparing the hybrid electrolyte for an electrochemical device. The hybrid electrolyte contains solvent(s), salt(s) and a polymer. An example of a combination of polymer and solvent includes a combination carbonate solvent, such as ethylene carbonate and propylene carbonate, as a solvent for the electrolyte (salt) and a vinylidene fluoride polymer (i.e. polyvinylidene fluoride or a copolymer of vinylidene fluoride) as the polymer (page 13, paragraph [0055]). When the above combination of a solvent and a polymer is employed, the impregnation is preferably conducted at a temperature of 35°C or less and the swelling is preferably conducted at the temperature of 80°C or more (page 13, paragraph [0055]). Hoshi does not teach incorporating the polymer electrolyte into a prefabricated electrochemical cell. See claims analysis above.

Kejha '084 teaches a single heating temperature (90°C) of the polymer electrolyte precursor before applying hot on a positive electrode. Kejha does not teach the  $T_{\text{dissol}}$  and  $T_{\text{gel}}$  of

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claim 1. Furthermore, Kejha teaches the precursor is cooled (gelled) before the anode is applied. Thus, the polymer electrolyte is gelled before the cell is fabricated.

Eschbach et al., US 5,681,357 teaches an electrochemical cell wherein a polymer electrolyte precursor is cured/gelled by placing the fabricated cell between heated plates, heated to a temperature of  $\sim 90^{\circ}\text{C}$ . The cell is then quenched which converts the PVDF into a gel, fusing the anode, cathode and separator of the cell together. See Example 1. Eschbach does not teach the  $T_{\text{dissol}}$  and  $T_{\text{gel}}$  of claim 1. Furthermore, the polymer dissolved in a solvent is added to an inert polymer separator and then the separator is placed between two electrodes, after which the electrolyte species (salt and solvent) are added. Thus, a polymer precursor solution containing solvent(s), salt(s) and a polymer (three together) is not heated and then incorporated into the cell in the method of Eschbach.

It is important to point out the Hoshi and Kejha are directed toward gelled polymer electrolytes that perform as both the separator and the electrolyte (no separate separator is required). However, the instant claims require the cell be fabricated before the polymer precursor is incorporated. Thus, the instant claims require an additional separator between the anode and the cathode of the prefabricated cell in order to prevent a short circuit. One of skill would not be motivated to apply the polymer mixtures of the prior art after the cell (anode/separator/cathode) has been fabricated because the gelled polymer electrolyte would not be able to serve the function of both separator and electrolyte.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tracy Dove whose telephone number is (703) 308-8821. The


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Examiner may normally be reached Monday-Thursday (9:00 AM-7:30 PM). My supervisor is Pat Ryan, who can be reached at (703) 308-2383. The Art Unit receptionist can be reached at (703) 308-0661 and the official fax numbers are 703-872-9310 (after non-final) and 703-872-9311 (after final).

January 22, 2003

  
**Patrick Ryan**  
**Supervisory Patent Examiner**  
**Technology Center 1700**